

### Assessment of left ventricular twist mechanics in tako-tsubo syndrome by two-dimensional speckle tracking echocardiography

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**Purpose.**— To assess left ventricular (LV) twist mechanics in patients (pts) with tako-tsubo syndrome (TTS).

**Methods.**— Two-dimensional strain and LV twist by speckle tracking echocardiography (echoPACK 7 version 108) was performed in 10 consecutive pts with typical TTS according to the Mayo clinic criteria ( $77 \pm 10$  years, 100% women, and mean LVEF  $44 \pm 10\%$ ), at the acute phase (within 24h after symptom onset) and after recovery (one month later). Ten healthy control (C) pts matched for age and sex (mean LVEF  $72 \pm 7\%$ ), and 10 pts with acute anterior myocardial infarction (MI) treated by successful primary angioplasty 24h before, matched for LVEF, were compared to TTS pts. LV twist was assessed using the parasternal basal and apical short-axis planes, and defined as the net difference in degrees of apical (Ar) and basal rotation (Br). LV torsion was defined as LV twist normalized for diastolic LV longitudinal length. Peak systolic and early diastolic, apical (As and Ad) and basal (Bs and Bd) rotation rate, and LV twisting rate (TR) and untwisting rate (UR) ( $^{\circ}/s$ ) were derived from rotational and twist curves. The time sequences were normalized to the percentage of systolic duration.

**Results.**— At the acute phase, Br, Bs, Bd were not significantly different between groups (all,  $P = NS$ ). LV twist and torsion ( $1.2 \pm 1.1^{\circ}/cm$  vs.  $2.8 \pm 1.1^{\circ}/cm$ ) were significantly reduced in pts with TTS as a result of severely impaired Ar ( $4 \pm 5^{\circ}$  vs.  $13 \pm 5^{\circ}$ ) when compared to C pts (all,  $P < 0.01$ ). Pts with MI displayed intermediate values ( $P = NS$  vs. TTS, and  $P < 0.05$  vs. C). Abnormal reversed apical rotation (clockwise when seen from the apex) was seen in 3 pts (30%) with TTS vs. none in the other groups. In pts with TTS, As, Ad, TR and UR were significantly reduced when compared to C ( $P < 0.05$  vs. C, and  $P = NS$  vs. MI). Furthermore, in pts with TTS, there was a significant correlation between plasma NT-proBNP and Ar ( $r = -0.6$ ), LV twist, LV torsion ( $r = -0.8$ ), and time to Ar ( $r = 0.8$ ) (all,  $P < 0.05$ ) but not with Br ( $P = NS$ ). At follow-up, LV twist, torsion, and Ar improved significantly in TTS and MI pts (all,  $P < 0.05$  vs. acute phase), whereas the magnitude of improvement was higher in TTS pts (all changes,  $P < 0.05$  vs. MI) who had final values similar to C (all,  $P = NS$ ). In pts with TTS, As, Ad, TR, and UR also improved significantly at follow-up (all,  $P < 0.05$ ).

**Conclusion.**— LV twist mechanics is significantly impaired in pts with TTS due to a severe reduction of apical function. This impairment is correlated to the increased LV wall stress and is entirely reversible.

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### Left ejection fraction evaluation by speckle tracking

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**Introduction.**— The biplane Simpson remains the gold standard for the evaluation of left ventricular ejection fraction (LVEF). However, it allows only a semi-quantitative assessment of the myocardial function without accurate quantification of the regional function. The speckle tracking echocardiography offers, not only regional deformation evaluation, but also global function assessment using the global longitudinal strain, which is correlated with LVEF given by biplane Simpson (LVEF Simpson).

**Objectives.**— The aim of this study is to describe the method based on an algorithm for the detection of myocardial motion allowing quantitative analysis of global longitudinal strain (GLS) and to compare the LVEF resulting from GLS (LVEF GLS) to the LVEF Simpson.

**Methods.**— One hundred and sixty-eight patients are scheduled for echocardiography because of diverse pathologies (coronary disease, dilated cardiomyopathy, valvular disease.), for preoperative non cardiac surgery, or for systematic exams. First, LVEF Simpson was calculated. Then, global longitudinal strain was obtained from the apical 2, 3 and 4 chamber views. Subsequently, LVEF GLS was calculated with Lim formula.

**Results.**— LVEF Simpson =  $61 \pm 14\%$  (min = 20%, max = 80%). GLS =  $17.5 \pm 5.2\%$  (min = 1.4%, max = 25.4%). LVEF GLS =  $62 \pm 15\%$  (min = 14%, max = 86%) with good correlation between the two methods ( $r = 0.87$ ,  $P < 0.001$ ). This correlation is verified in LVEF > 50% as well as in LVEF < 50%.

**Conclusion.**— The recommended echocardiographic method for LVEF assessment is the biplane Simpson but it is subjective based on visual endocardial thickening. The speckle tracking is a new method offering the opportunity to track myocardial deformation with excellent reproducibility independently of both cardiac translation and the insonation angle. It is user-independent, less time-consuming and feasible.

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### Effects of right ventricular pacing on Global Longitudinal Strain: Evolution in short term, mid term and recovery

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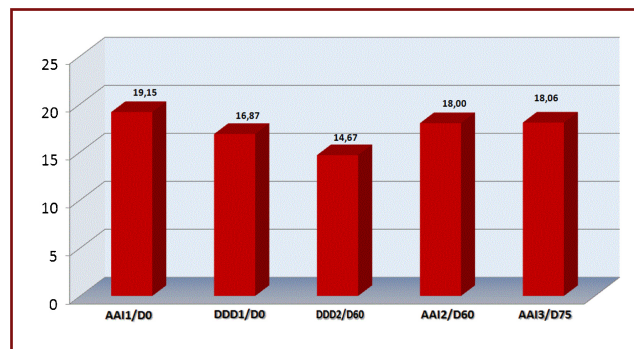
**Introduction.**— It is well known that right ventricular pacing (VP) can alter left ventricular (LV) function. But few are known in ability of LV recovery after VP.

**Objectives.**— The aim of this study is to evaluate LV function with 2D strain imaging after 2 months of right VP, immediately and at 2 weeks after stopping VP.

**Population and methods.**— Population consisted of 20 pts (12 women, mean age  $68.6 \pm 12$ , QRS < 120 ms, PR > 120 ms, normal LV ejection fraction) implanted for sinus node dysfunction with dual chamber pace maker (VP < 10%). Five TTE (GE Vivid 7 and Vivid 9) were performed at day 0 (D0) with AAI mode (AAI1) then DDD mode (DDD1), at day 60 (D60) with DDD (DDD2) then AAI mode (AAI2) and 2 weeks after the end of VP at D75 (AAI3). LV function was analyzed by global longitudinal strain (GLS) (Speckle tracking). Between D0 and D60, all pts were programmed in DDD with VP > 90%.

**Results.**— LS decrease significantly at D0 between AAI1 and DDD1 ( $-19.15 \pm 3.4$  vs  $-16.87 \pm 4.1$ ,  $P = 0.004$ ) but after 2 months of VP (D0–D60), LS is not significantly modified ( $-16.87 \pm 4.1$  vs  $-14.67 \pm 8.1$ ,  $P = 0.63$ ). At D60 between DDD2 and AAI2, GLS is increased ( $-14.67 \pm 8.1$  vs  $-17.99 \pm 2.4$ ,  $P = 0.048$ ). Between D60 (AAI2) and D75 (AAI3) there is no more significative increase in GLS ( $-17.99 \pm 2.4$  vs  $-18.06 \pm 2.7$ ,  $P = 0.9$ ).

**Conclusion.**— Longitudinal strain decreases immediately after VP, and recovers immediately after stopping VP. We didn't find any midterm evolution in GLS. Further studies are needed on a longer period of time to determine if recovery kinesis of GLS is modified with a longer period of pacing.



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